Earth Wheel Introduction: Webquest

Lesson Overview: This is the first of three lessons that have been developed to teach students about Earth's water cycle, the importance of freshwater resources, and how NASA studies water in Earth's systems. The purpose of this lesson is to introduce students to the new NASA "*Earth Wheel*". This lesson was developed for middle school students, but could be used with younger and older audiences. It includes a PowerPoint Presentation, an online IQuest which you will find at http://1.usa.gov/1nYdhCJ and a Student Capture Sheet. This is the first of a three-part lesson plan sequence. It is anticipated that this lesson will take one 45-minute class period.

NGSS: These standards will be introduced but not assessed in this lesson.

- **MS-ESS2-4.** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- **MS-ESS3-1.** Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- **MS-ESS3-2.** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- **MS-ESS3-4**. Construct an argument supported by evidence for how increases in human population and per-capital consumption of natural resources impact Earth's systems.

Background Information: NASA studies Earth's systems in a variety of ways, and has made tremendous strides in helping us better understand our home planet. To learn about the Earth-observing satellites that are currently studying Earth, please go to http://eospso.gsfc.nasa.gov. This lesson will focus on four of these missions that are looking at Earth's water cycle. These missions include Terra (http://1.usa.gov/1qO3CDa), Aquarius (http://1.usa.gov/1qOmRc2), TRMM (http://trmm.gsfc.nasa.gov), and GRACE (http://1.usa.gov/1zTxnUa). This Earth Wheel has been developed to support the 2014 Earth Science Week- learn more about this at http://nasaesw.strategies.org.

Materials: This lesson is primarily taught using computers with Internet access. Depending on available technology, this can be accomplished with one computer in a whole class setting or in a computer lab with a computer for each student. You will want to have the PowerPoint and a copy of the Student Capture Sheet for each student. The "*K-W-L*" chart can be done on the PP slide, or using a piece of chart paper or on the blackboard. As the students will watch a few videos, it would be helpful for them to have headsets if they are working on separate computers. You might choose to have students read print articles ("*Water's Family Tree*" and "*Precious Freshness*"), in which case you will want to make copies of these.

Engage: As the students look at the images of water (slide 2), have them answer the activator question on their Student Capture Sheets. You might choose to use this as a pre-

assessment, and have them answer the same question (perhaps even allowing them to use their completed capture sheet as notes) as a post-assessment. Then have a few students share their responses, and use them to begin a "*K-W-L*" chart (slide 3) about water on the blackboard or a piece of chart paper.

Explore: Students will read the article, "Water's Family Tree" (slide 4) to find out more about how water is created and how it came to Earth. While they can read this online, it could also be given to them as a print copy and they could highlight the information that answers the key questions. Students will look at a picture of Earth (slide 5) and will use it to answer the questions about Earth as a "Water Planet".

Explain: At this time, students should begin to work on the remainder of this IQuest using the online resources. As mentioned above, this could be done with one class computer and have the students work at the same speed, or letting them work independently or with a partner at their own speed. They will watch a few short videos, read another article, and visit four websites to learn about the four highlighted Earth-observing missions. Depending on how quickly they work, some students may finish early, and can do the "Extra for Experts" which has them visiting a NASA website about Earth-observing missions: http://eospso.gsfc.nasa.gov. For those students who need additional time, they could finish it for homework if they have access to computers, or perhaps have additional time to complete it during another class. Alternatively, the class could go over the answers together the next day, and students could fill in the answers they didn't get the day before.

Evaluate: Complete the "*K-W-L*" chart using responses from the students after they have completed the IQuest. As suggested previously, the teacher might choose to use the "activator" as a pre-assessment, and have them answer the same question (perhaps even allowing them to use their completed capture sheet as notes) as a post-assessment.

Elaborate/Extend: Students could use what they have learned about water in this lesson to begin a concept map (There are many good online tools for doing this). They could also develop a comic strip or a short booklet to tell the story of Earth's water and the importance of freshwater.